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GB 2292038 A GB 2240445 A EP 0671849 A1
EP 0225408 A1 US 5483284 A US 4672436 A
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(54) Abstract Title
Digital camera with a detachable display

(57) The digital camera includes a camera body 44 housing an optical lens 401, and a liquid crystal display section 42 hating a display panel 422, wherein the display section can be detached from the camera body. The present invention also includes a first transceiver 406 connected to the camera body for transmitting or receiving data to or from, respectively, the display section. A second transceiver 426 is further connected to the display section for transmitting or receiving the data to or from the camera body.

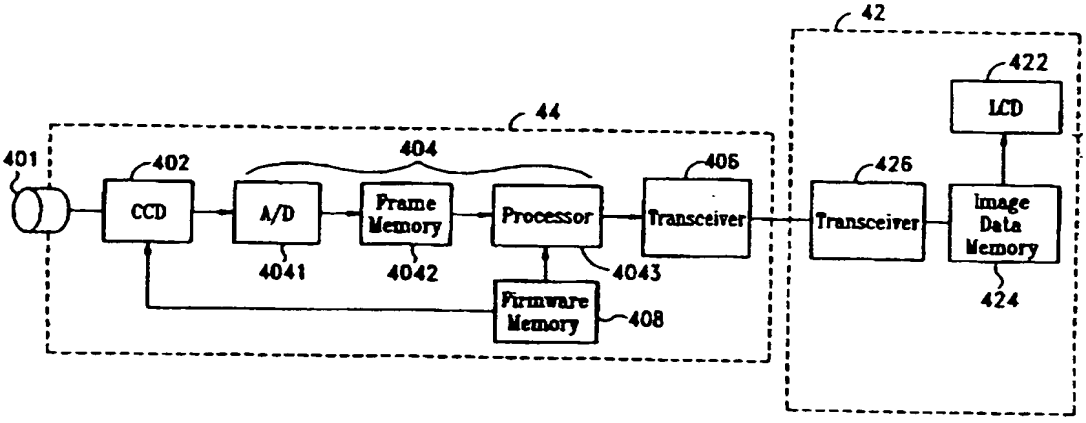

FIG.4

GB 2 331 422 A

DIGITAL CAMERA WITH A DETACHABLE DISPLAY

The present invention relates to a digital camera, and more particularly, to a digital camera with a detachable liquid crystal display.

As is understood in the art, a digital camera is a device that uses an electronic sensor, such as charge-coupled device (CCD), to capture an image. The captured signal is then processed to be represented numerically. Further, some storage devices are used to preserve these numerical image data. Finally, the stored image data is transferred to a computer for displaying or printing.

FIGURE 1 shows a conventional system 1 that coordinates a digital camera and a computer. This system 1 includes a digital camera 10 with an electronic sensor 102, a digital processing section 104, an image data memory 106. The system 1 also includes a computer 12 with a memory 122 for storing the image data from the digital camera 10, a central processing unit (CPU) 124, a display 14, and a printer 16. Images are captured by the sensor 102 (such as CCDs) via a lens 8, manipulated in the

processing section 104, stored in the memory 106, and finally transferred to the computer 14 via the interconnection 11. Memory card can be used to replace the image data memory 106 as known in the art.

FIGUREs 2A and 2B schematically illustrate a back view and a front view of the conventional digital camera 20. respectively. The digital camera 20 primarily includes a viewfinder 202, a liquid crystal display (LCD) 204 mounted at the back. and a lens 206 mounted at the front.

In order to facilitate convenient use for users, some manufacturers propose a digital camera 30 with a lens section 302 and a rotary LCD section 304 as shown in FIGURE 3 (only back side is shown). The maximum range of the rotary angle on the digital camera 30 is generally 270°.

However, in some particular situations, such as capturing a plane flying over, or remotely capturing an image, it would become inconvenient or unsuccessful to capture the images using the conventional digital camera. Therefore, a need has arisen to propose another type of digital cameras.

In accordance with the present invention, a digital camera is provided so that a liquid crystal display section can be detached therefrom. In one embodiment, this digital camera includes a camera body housing an optical lens, an electronic sensor for

transforming an image to an electrical signal, and an electronic processing section for converting the electrical signal to a digital signal. The liquid crystal display section includes a liquid crystal display, wherein the liquid crystal display section can be detached from the camera body. The present invention also includes a first transceiver connected to the camera body for transmitting or receiving data to or from, respectively, the liquid crystal display section, wherein the data including the digital signal from the camera body. A second transceiver is further connected to the liquid crystal display section for transmitting or receiving the data to or from, respectively, the camera body.

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 shows a conventional system that coordinates a digital camera and a computer;

FIGUREs 2A and 2B schematically illustrate a back view and a front view of the conventional digital camera, respectively;

FIGURE 3 schematically illustrates another conventional digital camera;

FIGURE 4 shows a block diagram illustrating a digital camera with a detachable liquid crystal display (LCD) section in accordance with one embodiment of the present invention;

FIGUREs 5A and 5B schematically illustrate a back view and a front view of the digital camera, respectively;

FIGUREs 5C and 5D show an example of the connector when the LCD section is detached from the camera section;

FIGURE 6 shows an application where a remote shutter control signal is transmitted from the LCD section to the camera section;

FIGURE 7 illustrates a general flow of wireless communication using IrDA protocol; and

FIGURE 8 shows another application where data are transferred among scanners, personal computers, printers, and notebook computers.

FIGURE 4 shows a block diagram illustrating a digital camera 40 with a detachable liquid crystal display (LCD) section 42 in accordance with one embodiment of the present invention. The digital camera 40 includes a primary section 44 and the detachable LCD section 42. The primary camera section 44 includes a charge-coupled device (CCD) 402, a digital processing section 404 (which includes an analog-to-digital converter 4041, a frame memory 4042, and a processor 4043), a lens 401, and a firmware memory 408. The LCD section 42 includes an LCD 422, and an image data memory 424 (which could be a random access memory or a memory card). Furthermore, transmitter/receivers (hereafter "transceiver") 406 and 426 are also included in the camera section 44 and the LCD section 42, respectively, for transmitting data therebetween in a wireless manner when the LCD section 42 is

removed from the camera section 44. Images are captured by the CCD 402 via the lens 401, manipulated in the digital processing section 404, transferred to the image data memory 424 via the transceivers 406 and 426, and displayed on the LCD 422. FIGUREs 5A and 5B schematically illustrate a back view and a front view of the digital camera 40, respectively. The digital camera 40 primarily includes a viewfinder 440, an LCD 422 mounted at the back, a lens 401 mounted at the front, a transceiver 426 mounted on the LCD section 42, and a transceiver 406 mounted on the camera section 44. Note a connector 43 is used to electrically connect the LCD section 42 and the camera section 44 when the LCD section 42 is physically connected to the camera section 44. An example of the connector 43 is shown in FIGURE 5C and FIGURE 5D, where the LCD section 42 is detached from the camera section 44. It is noted that a slot 425 for inserting the memory card 424 mentioned above is also shown in FIGURE 5D.

In this embodiment, an infrared communication protocol proposed by Infrared Data Association (IrDA) is used to transfer the image data from the camera section 44 to the LCD section 42 through the transceivers 406 and 426. In addition, some control signals, such as remote shutter control signals, can be transmitted from the LCD section 42 to the camera section 44 as illustrated by an application shown in FIGURE 6. Among many protocols proposed by the IrDA, a modulation rate of 4 M bits/sec is preferably adapted in this embodiment to transfer the moving and/or the captured images data between the LCD section 42 and the camera section 44.

A general flow of wireless communication using the IrDA protocol is

illustrated in FIGURE 7, where device A and device B represent the camera section 44 and the LCD section 42, respectively. At the beginning, device A detects existence of device B in block 701, and then device A sends a "connection request" to device B in block 702. This connection request generally includes address and data transfer rate. After device B receives the request, it acknowledge with return information, such as the address and the data transfer rate (block 703), and therefore both device A and device B will use common data transfer rate in the following communication. Subsequently, device A encodes the image data to be transferred according to the IrDA protocol (block 704), and then transmits the encoded data via infrared signal (block 705). After the data are received and decoded by device B, if a complete set of data is recovered (block 706), the communication ends subsequently (block 707); otherwise, an error is acknowledged by device B, followed by retransmitting encoded data by device A.

It is appreciated that the communication protocol used is not limited to those proposed by IrDA. Other protocol or proprietary method may also be used. It is further appreciated by the skilled artisans that the data can be transferred between the digital camera (40, 42) and other apparatus, such as scanners, personal computers, printers, or notebook computers, as illustrated in FIGURE 8.

Although specific embodiments have been illustrated and described, it will be obvious to those skilled in the art that various modifications may be made.

CLAIMS

1. A digital camera with a detachable display, said digital camera comprising:

means for capturing an image;

means for displaying said captured image, wherein said displaying means can be detached from said capturing means;

first transceiving means, coupled to said capturing means, for transmitting or receiving data to or from, respectively, said displaying means; and

second transceiving means, coupled to said displaying means, for transmitting or receiving the data to or from, respectively, said capturing means.

2. The digital camera according to claim 1, wherein said displaying means comprises a liquid crystal display.

3. The digital camera according to claim 1, wherein said capturing means comprises an optical lens.

4. A digital camera with a detachable display, said digital camera comprising:

a camera body housing an optical lens;

a display section having a display panel, wherein said display section can be detached from said camera body;

a first transceiver connected to said camera body for transmitting or receiving data to or from, respectively, said display section; and

a second transceiver connected to said display section for transmitting or receiving the data to or from, respectively, said camera body.

5. The digital camera according to claim 4, further comprising a charge-coupled device for transforming an image to an electrical signal.

6. The digital camera according to claim 5, wherein said camera body further comprises:

an analog-to-digital converter for converting said electrical signal to a digital signal;

a frame memory for storing the digital signal; and

a processor for processing the digital signal in a way suitable for transmission.

7. The digital camera according to claim 4, further comprising an image data memory connected to said display panel.

8. The digital camera according to claim 7, wherein said image data memory comprises a memory card which can be inserted into said display section.

9. The digital camera according to claim 4, wherein said display panel comprises a liquid crystal display.

10. A digital camera with a detachable liquid crystal display, said digital camera comprising:

a camera body housing an optical lens, an electronic sensor for transforming an image to an electrical signal, and an electronic processing section for converting said electrical signal to a digital signal;

a liquid crystal display section having a liquid crystal display, wherein said liquid crystal display section can be detached from said camera body;

a first transceiver connected to said camera body for transmitting or receiving data to or from, respectively, said liquid crystal display section, said data including said digital signal from the camera body; and

a second transceiver connected to said liquid crystal display section for transmitting or receiving the data to or from, respectively, said camera body.

11. The digital camera according to claim 10, wherein said electronic sensor comprises a charge-coupled device.

12. The digital camera according to claim 10, wherein said electronic processing section comprises:

an analog-to-digital converter for converting said electrical signal to the digital signal;

a frame memory for storing the digital signal; and

a processor for processing the digital signal in a way suitable for transmission.

13. The digital camera according to claim 10. further comprising an image data memory connected to said liquid crystal display.

14. The digital camera according to claim 13, wherein said image data memory comprises a memory card which can be inserted into said liquid crystal display section.

15. The digital camera according to claim 10. wherein said data is further encoded before being transmitted from said first transceiver to said second transceiver.

16. The digital camera according to claim 15. wherein said encoded data is further decoded after being received by said second transceiver.

17. The digital camera according to claim 10. wherein said data is further encoded before being transmitted from said second transceiver to said first transceiver.

18. The digital camera according to claim 17, wherein said encoded data is further decoded after being received by said first transceiver.

19. The digital camera according to claim 10, wherein said transmitting and receiving is done following an infrared protocol proposed by Infrared

Data Association (IrDA).

20. The digital camera according to claim 10, wherein said data comprises a control signal transmitted from said liquid crystal display section to said camera body for controlling a shutter in said camera body.

21. A digital camera substantially as herein described with reference to Figures 4 to 7 of the accompanying drawings.

The Patent Office

12

Application No: GB 9723995.8
Claims searched: 1-21

Examiner: John Coules
Date of search: 9 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): H4F FJL,FJS

Int Cl (Ed.6): H04N 1/00,5/225

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2292038 A	(Lam) see whole doc	1-4 and 10 at least
X	GB 2240445 A	(Samsung) see whole doc	1-4 and 10 at least
X	EP 0671849 A1	(LG Electonics) see whole doc	1-4 and 10 at least
X	EP 0225408 A1	(Olympus) see whole doc	1-5, 10 and 11 at least
X	US 4672436	(L Hawthorne) see whole doc	1-4 and 10 at least
X	US 5483284	(Nikon) see fig 4	1-5, 10 and 11 at least
X	US 4420773	(Nippon Kogaku) see figs 19-23	1-5, 10 and 11 at least

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family
A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

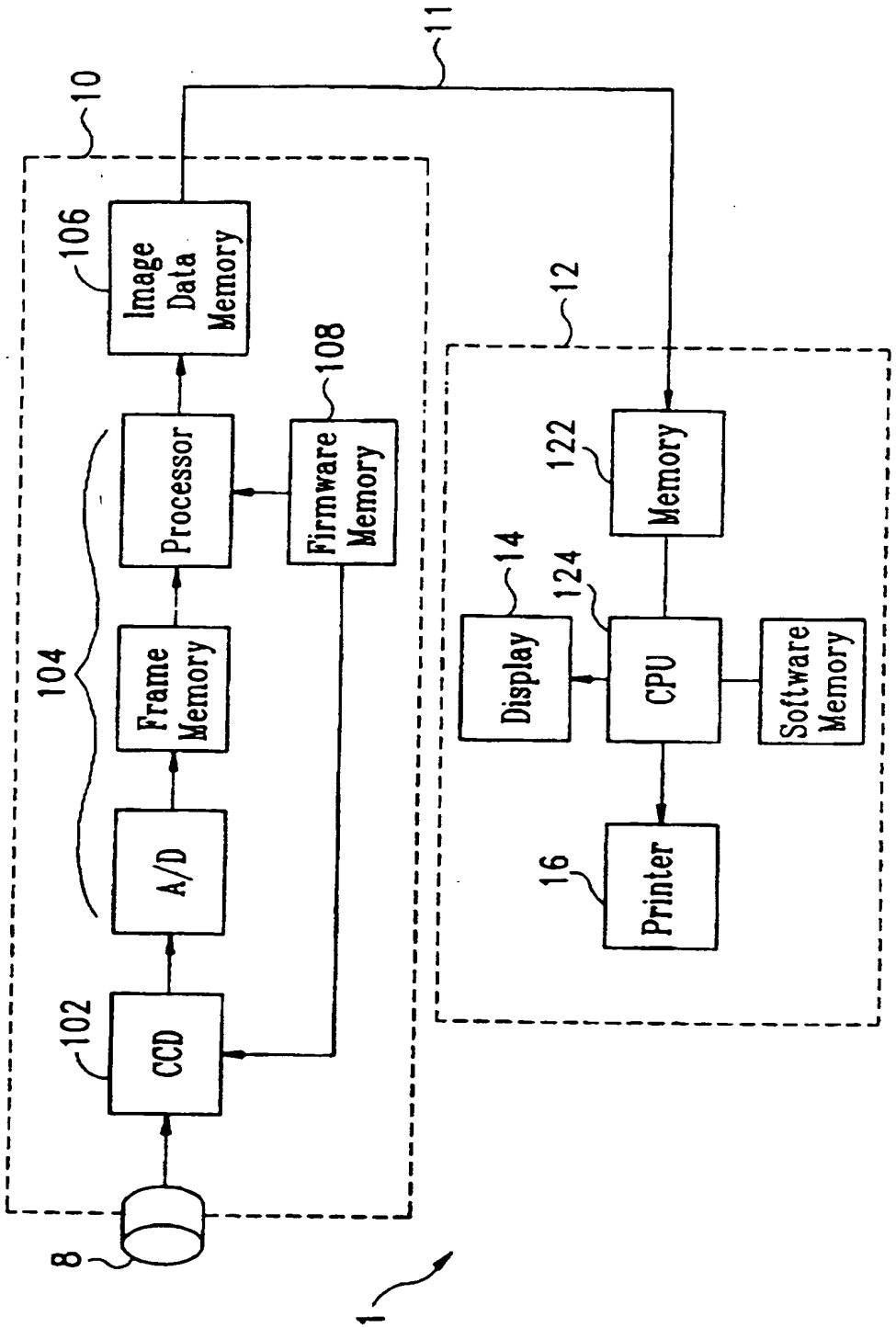

FIG.1 (Prior Art)

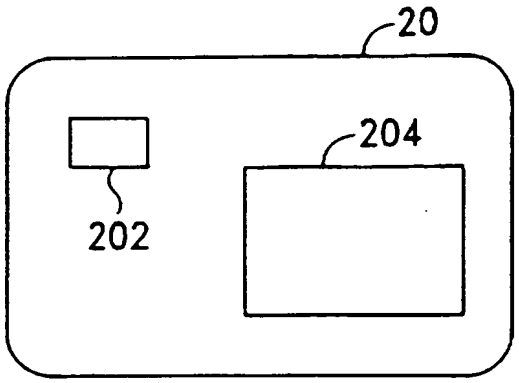

FIG.2A (Prior Art)

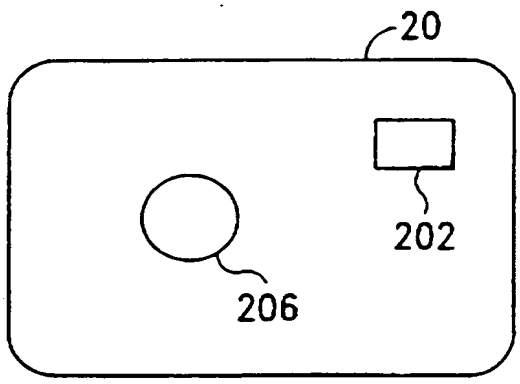

FIG.2B (Prior Art)

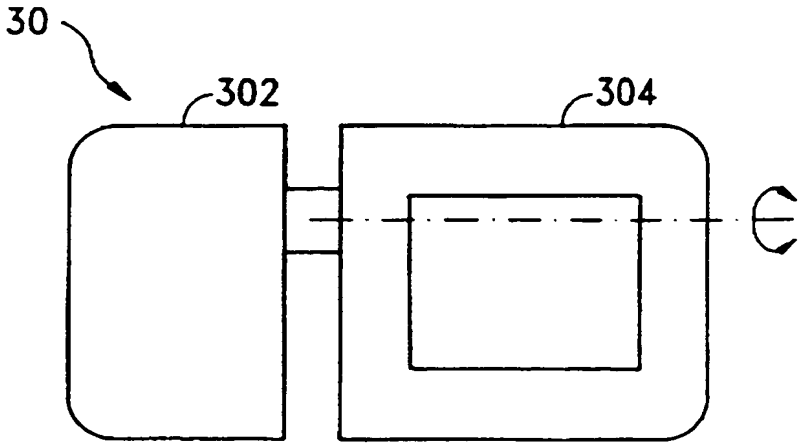

FIG.3 (Prior Art)

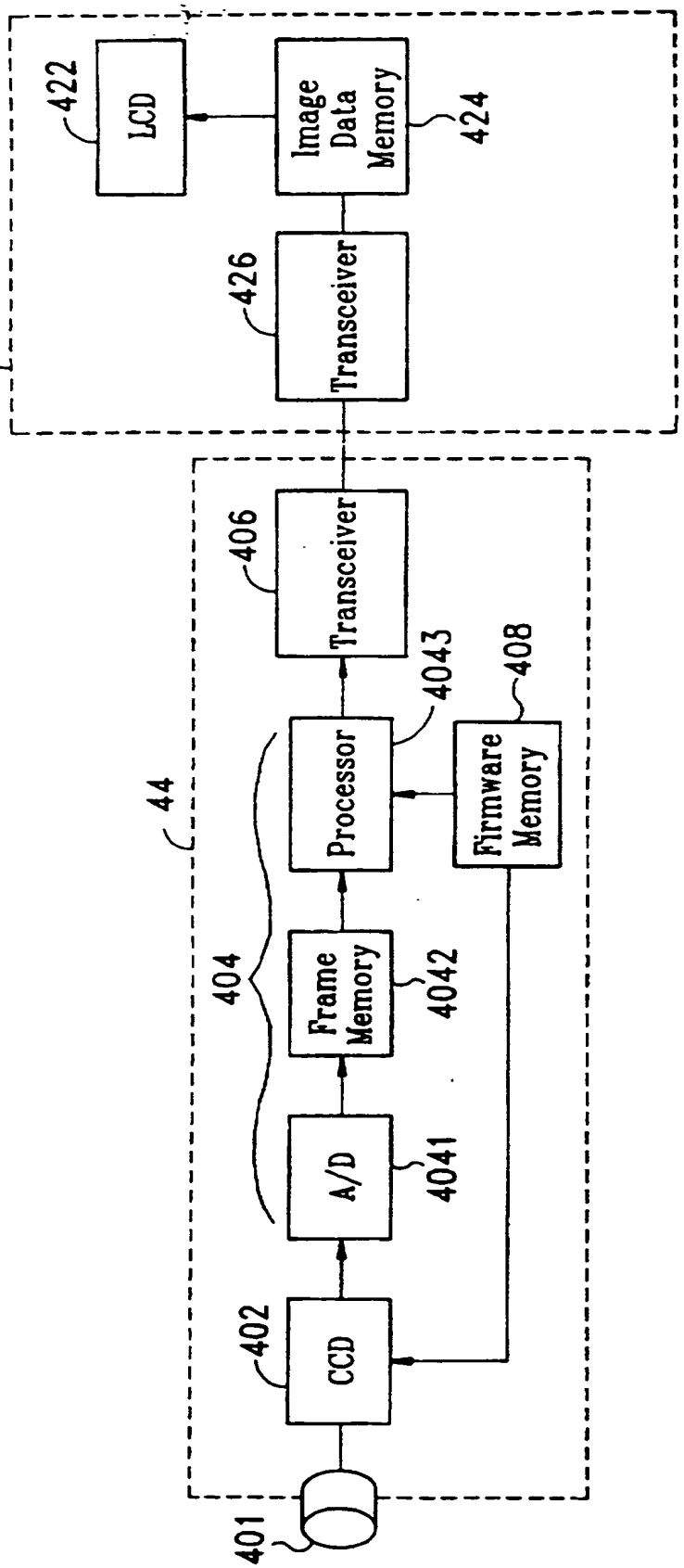
42
LCD
422
Image Data Memory
424
Transceiver
426
44
Transceiver
406
Processor
4043
Firmware Memory
408
404
Frame Memory
4042
A/D
4041
CCD
402
401

FIG.4

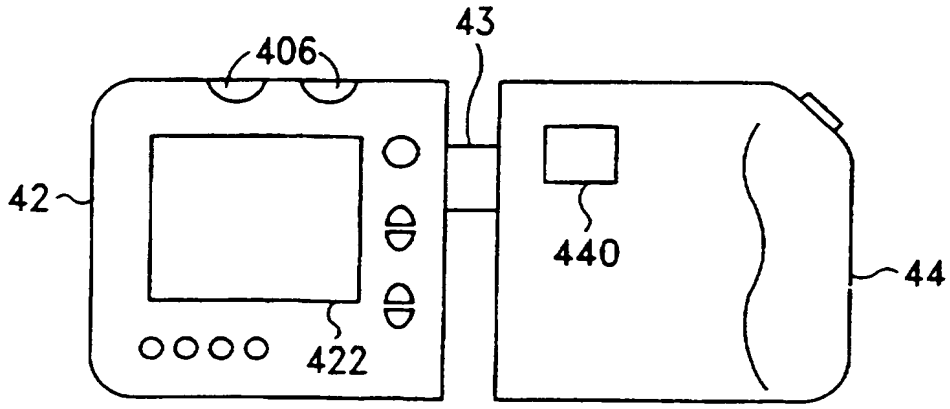

FIG.5A

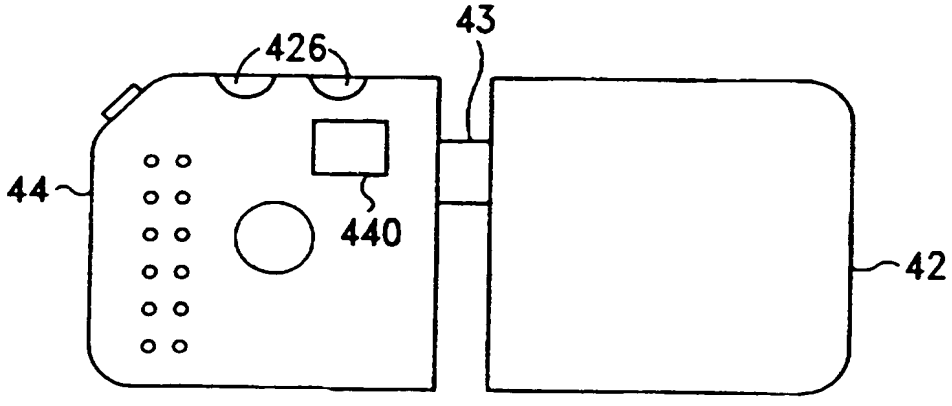

FIG.5B

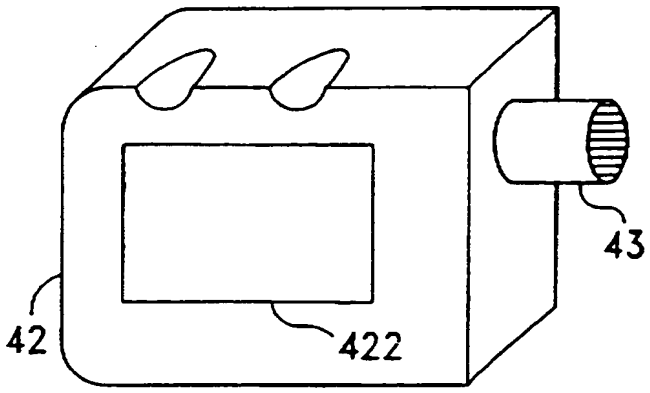

FIG.5C

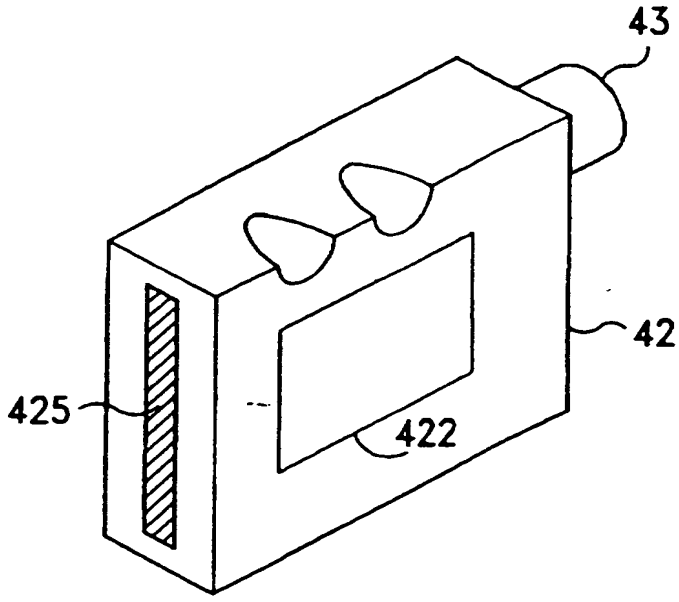

FIG.5D

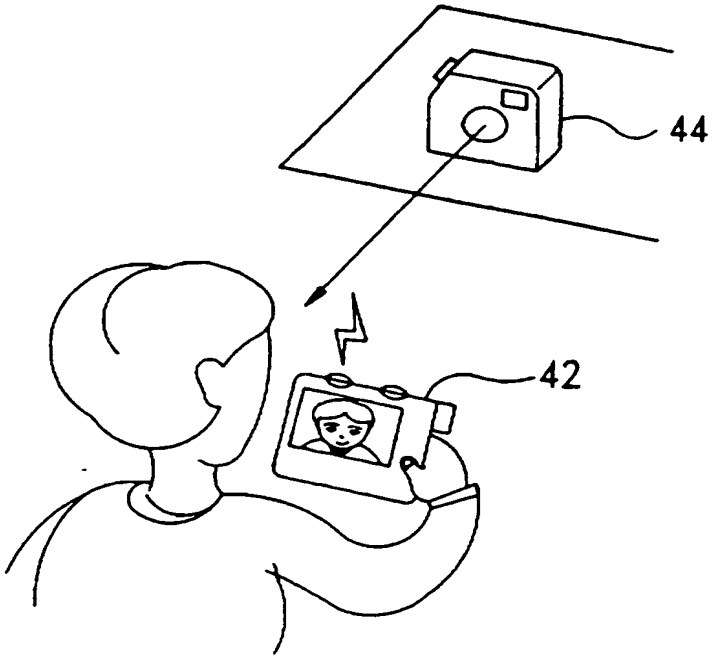

FIG.6

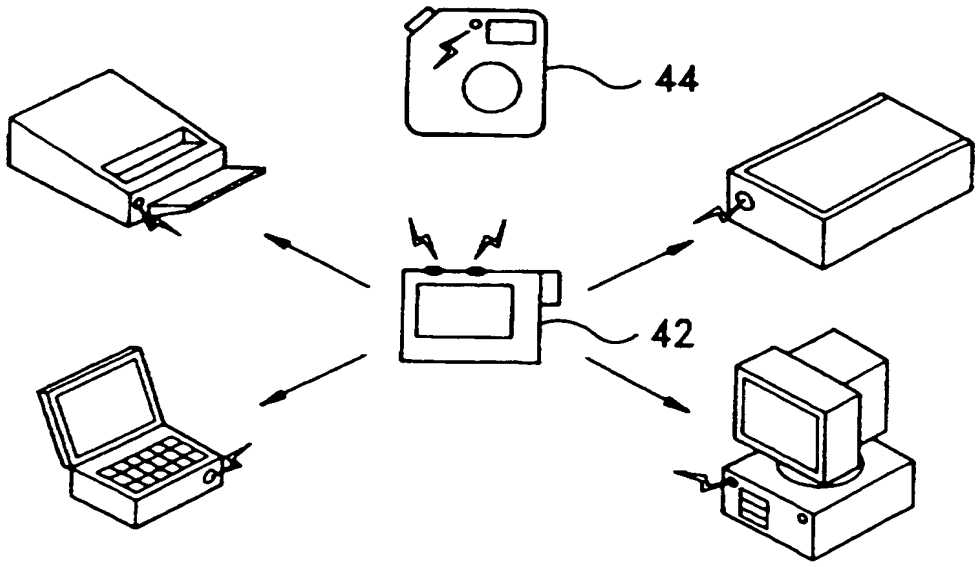

FIG.8

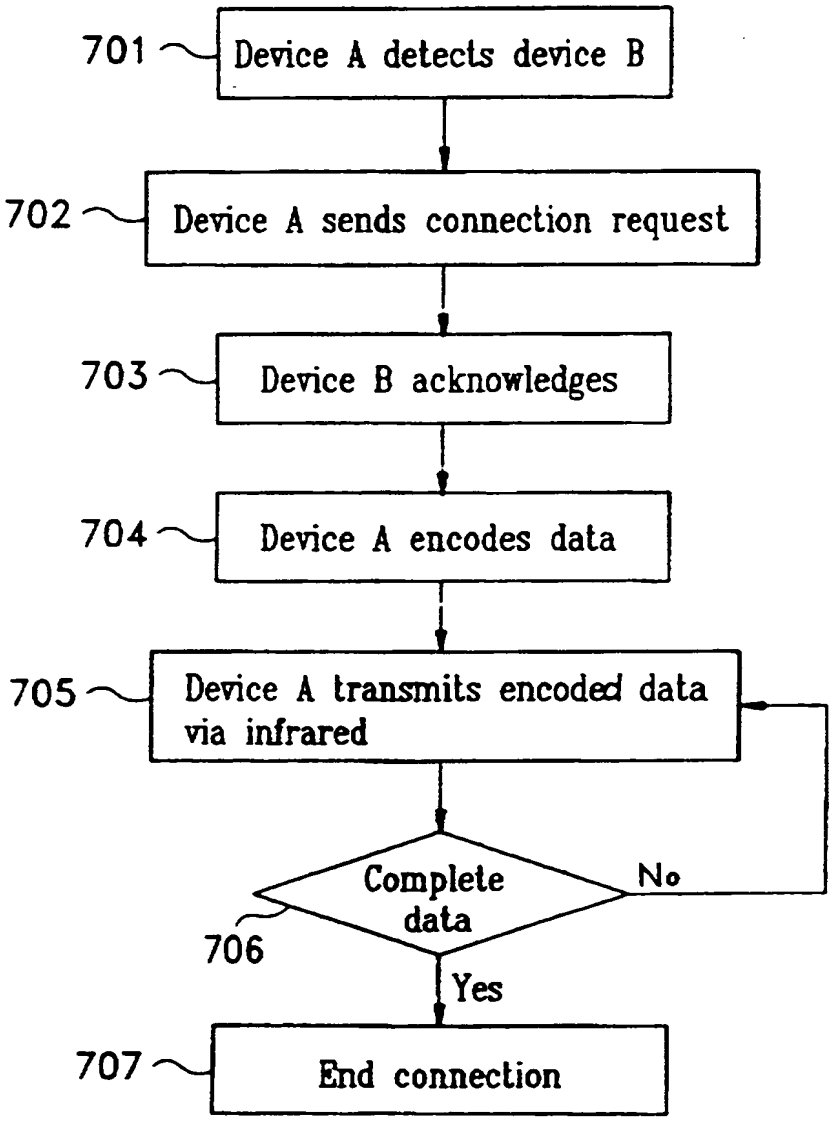
701
Device A detects device B
702
Device A sends connection request
703
Device B acknowledges
704
Device A encodes data
705
Device A transmits encoded data via infrared
Complete data
706
No
Yes
707
End connection

FIG.7